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Vol. 7. Part 9. Pp. 173-196. 15th September, 1938.

THE PROCEEDINGS

OF THE

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CONTENTS

PAGE

ANDREWES, H. E., F.R.E.S. On *Cillenus* Samouelle (Col. CARABIDAE) . . 190–196

EDWARDS, F. W., M.A., Sc.D., F.R.E.S. On the British LESTREMIINAE, with notes on exotic species.—4. (Diptera, CECIDOMYIIDAE) . . . . . 173–182, 3 figs.

TREHAN, K. N., M.Sc., Ph.D., F.R.E.S. Two new species of ALEURODIDAE found on ferns in greenhouses in Britain (Hemiptera) . . . . . 182–189, 42 figs.

LONDON:

PUBLISHED BY THE SOCIETY AND

SOLD AT ITS ROOMS, 41, QUEEN'S GATE, S.W.7

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ON THE BRITISH LESTREMIINAE, WITH NOTES ON EXOTIC SPECIES.—4. (DIPTERA, CECIDOMYIIDAE)

By F. W. Edwards, M.A., Sc.D., F.R.E.S.

Campylomyzini.

This tribe includes by far the largest number of species of the subfamily. The habits of the species are varied; many, perhaps the majority, live in dead wood; some are coprophilous or feed in fungi; one is recorded as injurious to the roots of clover. The flies are found mainly in spring and autumn, along hedgerows, on windows, and about old logs and fallen timber.

In addition to the main characters already indicated (Part 1 of this series, p. 24), a feature of this tribe is the arrangement of the pores on the wing-veins. These pores are here usually six in number, three being situated on *R*1 (two of these close to the tip of the vein), one at the junction of *Rs* and *rm*, the fifth either on *rm* or (as in fig. 8, f) on *R*5 near its base; the sixth (when traceable) near or beyond middle of *R*5. The position of pore no. 5 (whether on *rm* or on *R*5) seems to be of considerable importance in classification, though the pores are not always easy to detect unless the specimens are suitably mounted.

The numerous genera of Campylomyzini are rather badly in need of re-definition, a task which has been attempted in the ensuing pages. Many of the genera already proposed are so very similar that a reduction rather than an increase in their number seems desirable, but the genera are at least as well defined as those of the Cecidomyiinae, and I am, therefore, not proposing at present to carry this process of reduction very far. The following is an outline of the classification of the tribe here adopted; the three main groups are defined principally on wing-venation and the position of pore 5, but other supporting characters are found in the legs and hypopygium.

Group I. Costa produced, extending more than half-way from tip of *R*5 to tip of *M*, usually nearly to *M*. *R*1 long, at least three times, usually 4–6 times, as long as *Rs*. Pore no. 5 on *R*5, but well before level of tip of *R*1. Tarsi not scaly. Empodium always well developed. Palpi 4-segmented, the first segment not enlarged. Flies found mainly along hedgerows and on windows.

Genera: *Campylomyza, Cordylomyia, Corinthomyia.*

Group II. Costa as in Group I. *R*1 shorter, rarely more than three times and usually less than twice as long as *Rs*. Pore no. 5 on *rm*. Palpi often 3-segmented, first segment often somewhat enlarged. Flies found chiefly in woods.

Subgroup A. Empodium as long as claws and quite broad. Usually largish species with shining black thorax. Tarsi and palpi without distinct scales.

Genus: *Xylopriona* (including *Tetraxyphus*).

Subgroup B. Empodium rudimentary, or when (in a few cases) as long as the claws, then quite narrow. Thorax not shining black. Tarsi and palpi often with distinct scales.

Genera: *Aprionus, Bryomyia, Micromyia, Monardia, Mycophila, Pezomyia, Trichopteromyia.*

Group III. Costa ending abruptly at tip of *R*5, or if reaching slightly beyond then ending well before midway between tips of *R*5 and *M*. *R*1 rather short, usually less than

three times as long as *rm*, and usually somewhat more curved up towards costa at tip than in Groups I and II. Pore no. 5 on *R*5, usually approximately at level of tip of *R*1. Palpi often with less than 4 segments. Flies run much more actively than those of the other two groups; found chiefly in summer. Size usually very small.

Genera: *Joannisia, Peromyia.*

Campylomyza Mg.

Amblyspatha Kieff., ♂; *Cylophora* Kieff.; *Neurolyga* Rond.?; *Prionellus* Kieff.; *Urosema* Kieff.?

In a paper published early this year (1938, *Encycl. Ent.* (*Diptera*), **9** : 47–52) I redefined this genus in accordance with a study of Meigen's type-specimens. The generic diagnosis there given is repeated below with slight modifications (*e.g.* the erroneous statement that the empodium is hairy *above* is corrected):

Eyes each so much narrowed above the middle that a small upper part is completely separated from the large lower part by a gap in which there are either no facets at all or (occasionally) one or two irregularly placed; the small upper portions of the two eyes are practically fused in the middle line (fig. 8, a, b). The small frons is flat and without scales or hairs. Antennae of ♂ with 2 + 12 segments, the flagellar segments not very excentric, each with two complete crenulate whorls and another incomplete one distally, sensoria rudimentary. Antennae of ♀ with 2 + 10 to 2 + 12 segments, flagellar segments each with a subapical membranous collar forming a complete cup-shaped structure, this cup arising from numerous small punctures, no very large pores being present. Palpi 4-segmented, rather long, first segment not much larger than second.

Mesonotum clothed with small hairs which are rather uniformly distributed, not arranged in definite stripes; integument not or scarcely shining. Legs with the vestiture composed entirely of hairs, no definite scales even on tarsi. Empodium broad, hairy beneath and as long as claws, usually conspicuous by its whiteness by reflected light. Claws usually with a few microscopic serrations or striations on one side near middle. Last segment of front tarsi of ♀ never much enlarged, but usually appearing darker than the rest. Wings rather densely hairy over the whole surface and rather broad. *R*1 several times as long as *Rs*, the latter not very oblique; costa almost reaching tip of *M*; *Cu*2 straight and ending rather abruptly well before the wing-margin. Abdomen of ♂: Tergites 5–8 all reduced to narrow strips, so that the end of the abdomen tends to contract and the hypopygium to turn upwards or forwards. Ninth tergite also mainly membranous, the only sclerotised portion being a continuous narrow strip on the posterior border; anal segment small, hidden under ninth tergite, without definite sclerotised parts; coxites short, more or less extensively fused at base beneath; style hairy, without spine at tip; roots of coxites (*rc*) united to form a semicircular loop; tegmen almost divided into two parts, each with a rather complex process; genital rod large and capitate. Abdomen of ♀ not very extensile; only one spermatheca present, this being large and disc-shaped with darkened margin (the shape is apparently natural and not due to collapse in the mounting medium, as none of the very numerous specimens examined shows a spherical spermatheca); tergites 2–4 (or at least 2 and 3) divided in the middle.

The divided eyes and cup-like sensoria of the female together provide the main distinctions of *Campylomyza* s.str. from other genera of the tribe. No other genus has similar sensoria, unless *Urosema* Kieff. is to be regarded as distinct; I have included it only as a doubtful synonym because Kieffer emphasises the densely hairy ovipositor, no *Campylomyza* known to me shows this structure.

The species of this genus are rather numerous, and several of them appear to be very abundant and widely distributed. Specific characters, however, are difficult to appreciate, and a great deal more study is needed before the genus can be properly understood; it may be that here, as in many other genera of CECIDOMYIIDAE, morphological features will be found to distinguish the species less clearly than habits and life-history.

Amongst the British material examined (almost entirely consisting of captured specimens) I believe I can distinguish at least eight or ten species, but several of these (e.g. *C. flavipes*, *fuscipes*, *bicolor*, *pumila*) seem to grade into one another, and individual variation is certainly considerable. By analogy with the PSYCHODIDAE (as recently studied by Tonnoir) one might have expected the form of the tip of the antenna of the female to be constant for each species, but apparently it is not always so here; the length of the neck of the penultimate segment of the male antenna is one of the few features which has been relied on for differentiation, but this also varies a good deal individually as well as specifically, and the same is true of the relative lengths of the last two segments of the palpi. The variation in antennal structure seems to be to some extent correlated with size, small specimens tending to have shorter necks to the segments and in the case of females one or two fewer segments; it is doubtless also true that size is to some extent a character of the species. The colour of the legs and abdomen may help in distinguishing some species, but too much reliance should not be placed on these features, as immature specimens are always paler and those taken in winter or early spring may tend to be darker.

Differences between the species in male hypopygial structure are in some cases well marked, but in others very slight. In comparing hypopygia it should be noted not only that the parts may appear very different in different positions of the whole organ, but also that the aedeagus may occupy two different (more or less fixed) positions relatively to the other parts (these two positions are shown for *C. flavipes* in fig. 8, n, o, and for *C. bicolor* in fig. 9, u).

In addition to the species discussed below, the following European types belong to *Campylomyza* s.str., but cannot be precisely identified: *C. luculenta* Mg., *pallipes* Zett., *squalida* Winn., *vittata* Winn.

C. flavipes Mg. (fig. 8).

C. aceris Mg.; *C. aequalis* Winn.; *Prionellus minor* Kieff.?

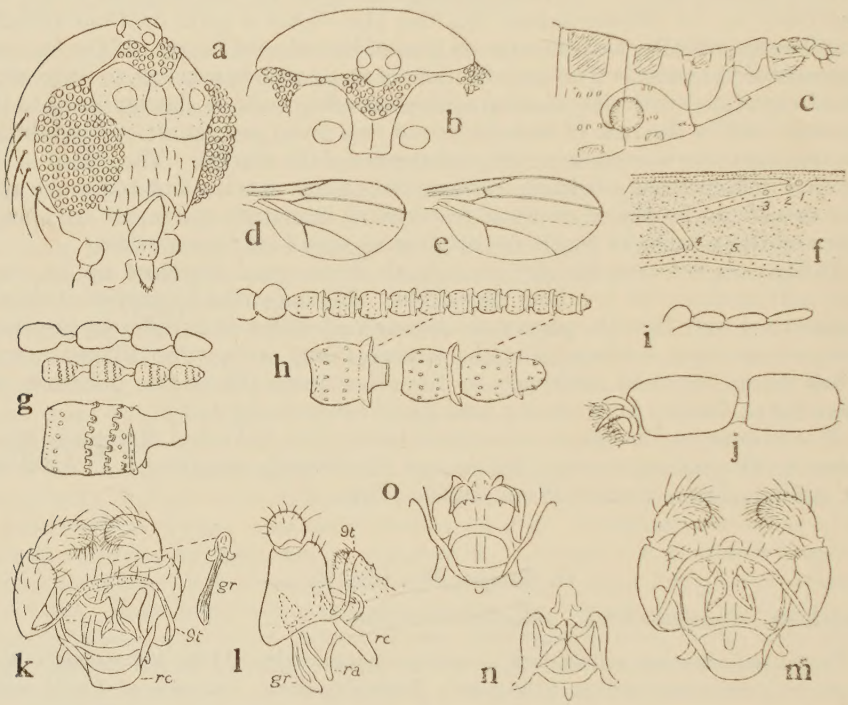
Thorax and abdomen mainly dark, membranous parts light reddish; legs mainly yellow, femora in ♀ and sometimes in ♂ darkened; halteres yellow. Antennae of ♂ with necks of flagellar segments short, barely half as long as the basal portion, neck of penultimate segment usually entirely lacking but sometimes present (at most as long as broad). Antennae of ♀ with 2 + 10 segments, intermediate segments very little longer than broad and with short necks, penultimate segment as in ♂ devoid of neck; collars not very deep; terminal segment with collar beyond middle, distal part smaller. Palpi with fourth segment somewhat longer than third. Fifth tarsal segment of ♀ slightly longer but not much thicker than fourth; claws with about four minute teeth. Hypopygium: Coxites not distinctly lobed, broadly fused at base ventrally; style small, bluntly rounded at tip, scarcely curved; ends of tegminal processes leaf-like. Wing-length, ♂ 1·2 mm., ♀ 1·5 mm.

This species, the genotype of *Campylomyza*, is fairly easily distinguished from its congeners by its small size and antennal structure in both sexes. Numerous specimens examined from various localities in Herts., Beds., Oxon.

C. fuscipes Mg.

In my paper quoted above I suggested that this species should be placed as a synonym of *flavipes* because the type has a hypopygium apparently identical with that of *flavipes*, but as Meigen emphasised the dark legs it may be preferable to use his name *fuscipes* for a form which is indeed extremely similar to *flavipes* but differs as follows :—

Size rather larger; wing-length of ♂ 1·4–1·7, ♀ 2–2·3 mm. Legs of ♂ with femora and tibiae rather dark, ♀ more so. Antenna of ♂ with a short neck (rather longer than broad) to penultimate segment; antenna of ♀ with last (tenth flagellar) segment longer than in *flavipes*, constricted in middle. Hypopygium practically as in *flavipes*, but coxites perhaps relatively smaller.



8

FIG. 8.—*Campylomyza flavipes* Mg. a, head, half side view, to show form of eyes; b, eye-bridge from above; c, tip of ♀ abdomen; d, e, wings of ♂ and ♀; f, part of wing enlarged to show pores; g, tip of ♂ antenna (two variations), with single segment enlarged; h, antenna of ♀; i, palp; j, tip of front tarsus of ♀; k, l, hypopygium of ♂ from above and from side (Letchworth); m, hypopygium of ♂, var. (Sidmouth); n, o, aedeagus in two different positions.

Specimens examined from Herts. (Letchworth, Todd's Green); Beds. (Whipsnade); Glos. (Chedworth), Somerset (Castle Naroche, ♂♀ *in cop.*); Devon (Clovelly). This form seems intermediate between *flavipes* and *bicolor*.

C. bicolor Mg.

Prionellus pini Kieff.?; *Cylophora fasciata* Kieff.?

I propose to use Meigen's name *bicolor* for a form with the following characters :—

Larger and darker than *flavipes* or *fuscipes*; wing-length in ♂ about 1·7–2 mm., ♀ about 2·5 mm. Antenna of ♂ with necks of flagellar segments longer, that of penultimate segment about twice as long as broad. Hypopygium of ♂ differing slightly from *flavipes* or *fuscipes* in shape of style, which is somewhat curved, with the tip more hairy and pointed. Antenna of ♀ (if correctly associated with ♂) longer than in *flavipes* or *fuscipes*, last (tenth) flagellar segment long but not much constricted in middle. Last tarsal segment of ♀ not swollen.

Numerous ♂♂ examined from Herts. (Baldock, Weston, Hitch Wood), Oxon (Oxford).

This species fits Kieffer's description and figures of *Prionellus pini* (genotype of *Prionellus*) better than any other known to me. Except that the claws are described as simple (probably owing to Kieffer having overlooked minute serrations) the description of *Cylophora fasciata* might also apply to the female of this species; in any case it must be one of this group.

C. pumila Winn.

C. analis Winn.; *C. vivida* Winn.; *C. munda* Winn.?; *Monardia seaci* Barnes.

A blackish species with dark legs; closely resembles *bicolor* as identified above, differing most obviously in the longer necks of the flagellar segments of the ♂, that of the penultimate segment being about two-thirds as long as the basal part. Antenna of ♀ with 2 + 11 segments, the last two well separated (at least in some specimens). Last front tarsal segment of ♀ not swollen. Hypopygium of ♂ not differing very obviously from *bicolor*.

Numerous specimens examined from Herts. (Letchworth, Todd's Green); Oxford; Cambs. (Cambridge, Newmarket); Devon (Sidmouth).

Winnertz's type males of *pumila*, *analis* and *vivida* show no appreciable differences in antenna or hypopygium and are almost certainly conspecific; the type male of *seaci* is also quite similar. *C. munda* was described from the female only, but I have little doubt it belongs here. The species, moreover, is doubtfully distinct from *bicolor*.

C. strobli (Kieff.).

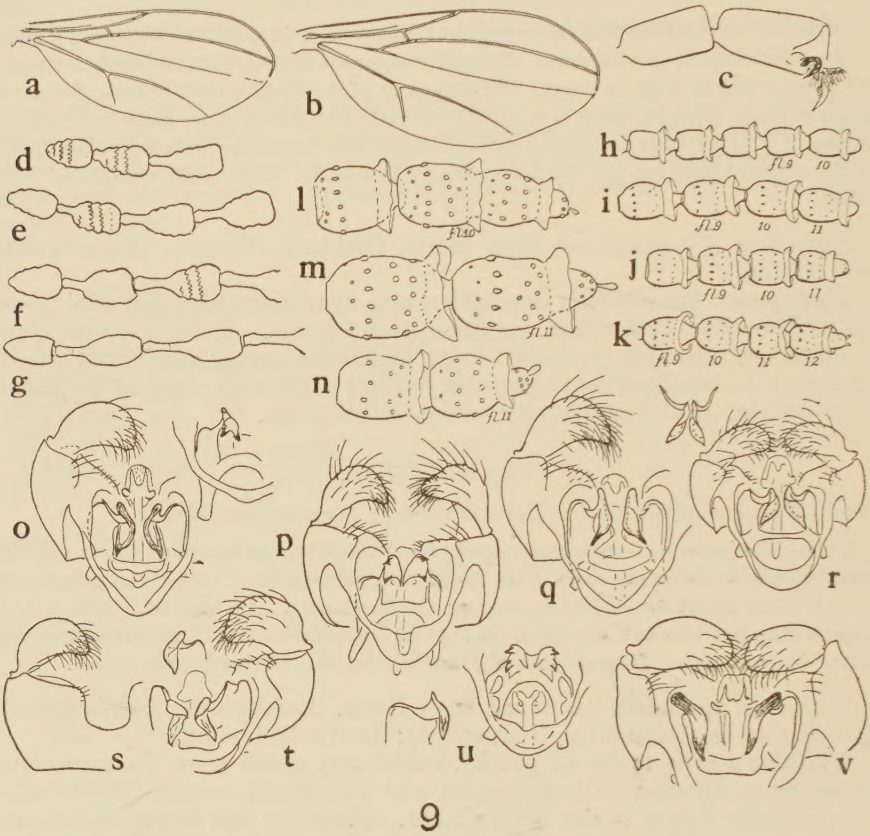
Prionellus strobli Kieff.

Kieffer's type ♀, which I have examined, evidently belongs to a species closely related to *pumila*; it may actually be the same, but a possible specific difference is that the last tarsal segment of the front and middle legs is rather distinctly swollen (fig. 9, c). The antennae of the type are broken; the first few segments are quite half as long again as broad, with deep and somewhat irregular collars.

A ♀ closely resembling Kieffer's type was taken paired with a ♂ at Dunham, Lancs., by Mr. H. Britten, 14.ii.1920. The following diagnosis is drawn up from this pair :

Dark species with blackish legs. Wing-length ♂ 2 mm., ♀ 2·8 mm. Antenna of ♂ with fairly long neck to penultimate segment (fig. 9, f), but not quite so long as in typical

pumila. Antenna of ♀ (fig. 9, m) with 2 + 11 segments. Palpi of ♂ with fourth segment about half as long again as third, of ♀ nearly twice as long. Hypopygium (fig. 9, q) much as in *pumila* but processes of tegmen appear rather differently shaped in the mount. Venation about as in *pumila*, but wings rather broader at base, especially in ♀.



9

FIG. 9.—British *Campylomyza* (mostly to scale of corresponding parts in fig. 8). a, b, wings of ♂ and ♀, *pumila*; c, tip of front tarsus of ♀, Kieffer's type of *strobli*. d–g. tip of ♂ antenna: d, *fuscipes* (Weston); e, *bicolor* (Baldock); f, *strobli* (Dunham); g, *pumila* (Barnes' type of *seaci*). h–n, tip of ♀ antenna: h, *bicolor*? (Weston); i, m, *strobli* (Dunham); j, k, *pumila*?, two variations (Letchworth); l, *fuscipes*? (Castle Naroche); n, *pumila* (Oxford). o–v. hypopygia of ♂, mostly dorsal view with ninth tergite removed: o, *pumila*, tegmen in two different positions, same specimen (Oxford); p, *bicolor* (♂ in Meigen's collection); q, *strobli* (Dunham); r, *fuscipes* (Letchworth); s, *pumila*, ventral view of coxite and style (Barnes' type of *seaci*); t, *pumila* (Winnertz's type); u, *bicolor*, tegminal processes in two positions, same specimen (Oxford); v, *flavicoxa* (Winnertz's type).

C. flavicoxa Winn.

The type resembles *pumila*, notably in having a long neck to the penultimate antennal segment, but the hypopygium differs slightly (fig. 9, v) and the legs are entirely yellowish, including the coxae. A specimen taken by me at Ivinghoe

Common, Bucks., 3.x.37, has a very similar hypopygium, though its legs are not so pale. These specimens may represent slight variations of *pumila*, or possibly another allied species.

Campylomyza sp. indet.

A ♂ taken by me at Sherrard's Wood, Welwyn, Herts., 22.x.1936, has antennae similar to *pumila* but is smaller (wing-length 1·6 mm.) and the hypopygium (fig. 10, l) seems to show rather definite differences from *pumila* and related species. Having only one specimen I refrain from naming it. A specimen taken under a yew-tree at Low Wood, N. Lancs., 20.v.38, has a similar hypopygium but the penultimate antennal segment has a very short neck; this may represent still another species.

C. fusca Winn.

C. obscura Winn. ♀?; *Monardia populi* Felt.

A dark species with almost entirely blackish thorax and legs, pale halteres and reddish abdominal membrane, rather closely resembling *bicolor* and *pumila*. Penultimate segment of ♂ antenna with a moderately long neck, usually about half as long as the basal portion but sometimes shorter, in one very small specimen practically absent. Antenna of one ♀ taken *in copula* with 2 + 11 segments, the terminal segment constricted in middle and with two sensorial cups; other ♀♀ taken in company with ♂♂ (but not paired) show variation in the antennae, the last being only as long as the penultimate and sometimes connate with it; in all cases the antennal segments are shaped as in *bicolor*, being about half as long again as broad and with short necks. Claws with several fine serrations as in *flavipes* and *bicolor*; last tarsal segment of ♀ about equal to the fourth in length and thickness.

Hypopygium of ♂ (fig. 10, s) differing rather conspicuously from *flavipes*, *bicolor* and related species in having the coxites separated almost to base ventrally and with a small rounded dorsal apical lobe fringed with hair; style also differing in having long erect hair on the inner surface as well as at the tip, and probably on this account it is normally held directed straight backwards instead of being infolded as is usually the case in the *flavipes* group; tegmen (fig. 10, t) of very characteristic form, quite different from that of the *flavipes* group. Wing-length, ♂ 1·2–1·8, ♀ 2–2·3 mm.

Numerous specimens examined from Herts. (Hitchin, Baldock, Breachwood Green, Todd's Green) and Beds. (Whipsnade).

Felt's photograph of the hypopygium leaves little room for doubt that this species also occurs in North America under the name *Monardia populi* Felt.

C. furva sp. n.

A dark species with blackish legs and even the halteres more or less smoky at base; very similar to *bicolor* and *fusca*.

♂. Antennae with short neck to penultimate segment, usually about one-third as long as basal portion, but may be even shorter. Palpi with third segment barely twice as long as broad, fourth nearly twice as long as third. Hypopygium (fig. 10, o) resembling that of *fusca* in having the coxites united to only a small extent at base beneath and style with many longish hairs on inner surface, but tegmen quite different, more resembling that of *ormerodi*; dorsal apical margin of coxite rounded, not forming a very definite lobe; style in most specimens infolded. Claws perhaps with the serrations fewer and finer, and empodium perhaps narrower than in the *flavipes* group. Wing-length 1·4–1·7 mm.

♀. Not certainly identified; a single specimen taken in company with a ♂ (but not paired) has antenna with 2 + 10 or 2 + 11 segments (the last segment divided on one antenna, not on the other), in shape resembling *bicolor* or *fusca*; fourth front tarsal segment short, fifth distinctly longer and thicker than fourth. Wing-length just under 2 mm.

Herts.: Breachwood Green, 3.v.36, ♂ (type); Todd's Green, 4.v.38, 7 ♂♂; Fisher's Green, 4.v.38, 1 ♂, 1 ♀. All taken at edges of oak woods.

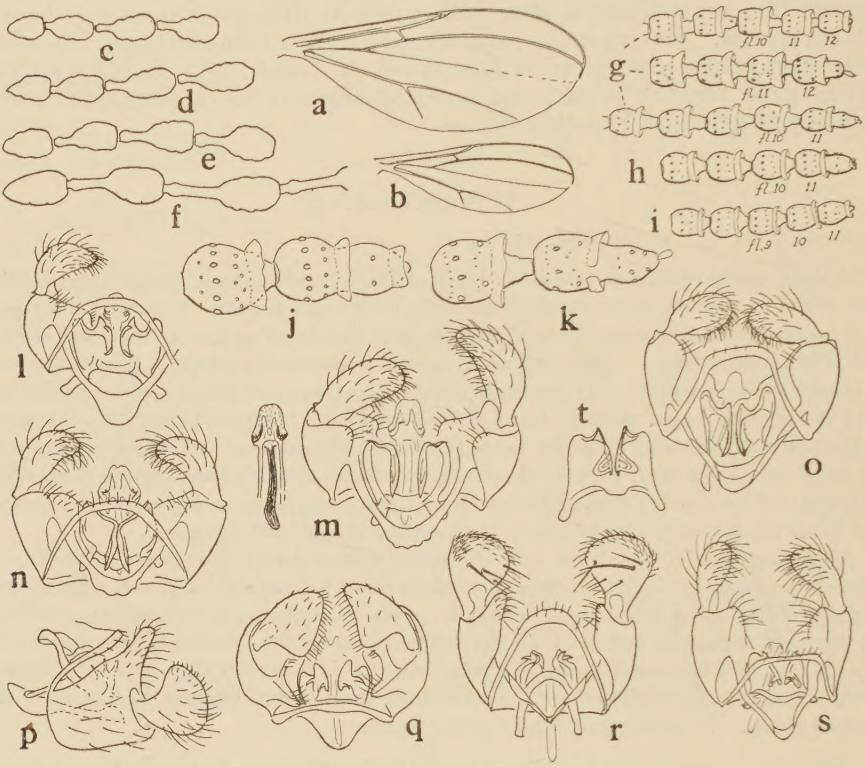


FIG. 10.—British *Campylomyza*. a, b. wings of *ormerodi*: a, large ♂; b, small ♂. c–f. tips of ♂ antenna: c, *furva*; d, *fusca*; e, *lobata*; f, *ormerodi*. g–k. tips of ♀ antenna: g, k, *ormerodi*, three variations (Ivinghoe, Sidmouth, Harpenden); h, j, *fusca*; i, *lobata*. l–s, hypopygia of ♂, mostly complete, dorsal view: l, sp. indet. (Welwyn); m, *ormerodi* (Radwell; tergite removed, genital rod shown separately); n, *ormerodi*, var. (Welwyn); o, *furva* (Breachwood Green); p–r, *lobata*, side, end, and dorsal views; s, *fusca*. t, tegmen of *fusca* to larger scale.

C. ormerodi (Kieff.).

Amblyspatha ormerodi Kieff., ♂.

♂. Very like *pumila*; necks of flagellar segments even longer than in that species, on penultimate segment almost as long as the basal part. Palpi rather short, last two segments subequal in length. Claws with the fine serrations fewer than in the other species (2–3 at most). Wings (at least in the specimens examined) with cubital fork more acute

than in *flavipes*, *bicolor* and related species; wing in a small specimen 1·5 mm., in a large one 2·2 mm. long, the small specimen (fig. 10, b) having the wing narrower than the large (fig. 10, a) one and with *R*1 shorter (only about twice as long as *r–m*). Hypopygium (fig. 10, m, n) of similar type to that of *pumila* but with quite different tegmen, somewhat resembling that of *furva*; structure identical in the large and small specimens.

♀. Size variable, wing 2–3 mm. Colour dark, usually including legs, but halteres pale. Antennae (fig. 10, g) differing from those of all the species discussed above in having very distinct necks to the segments; flagellum with 11 or 12 segments, in the former case the terminal segment is long with narrower distal portion, in the latter the terminal segment may be small or (as in the case of Winnertz's type of *picea* and in one of several specimens from Sidmouth) larger, with a nipple-like tip simulating a small 13th segment (fig. 10, g, middle figure). Palpi and claws as in ♂; one abnormal ♀ has 3-segmented palpi, the last two being fused. Fifth tarsal segment rather longer than fourth.

Herts.: Harpenden (*W. E. Hodson*), a short series bred from larvae attacking clover roots (including the large and small ♂♂ mentioned above); Letchworth, Radwell and Welwyn, ♂♂ ♀♀ captured. Bucks.: Ivinghoe, ♀ captured. Devon: Sidmouth, several ♀♀ captured on window of beach shelter. Brecon: Crickhowell, 1 ♀ captured.

Winnertz's type ♀ of *C. picea* appears to me to belong to the same species as the one described above, but I hesitate to adopt his name because of the difference in life-history: *ormerodi* according to MacDougall is a widespread pest of red clover, whereas the type of *picea* was reared from rotten wood (beech). It should be noted that Kieffer's description of the female *ormerodi* (added subsequently to the original publication) does not apply to the females reared by Mr. Hodson, but the latter are doubtless the true *ormerodi*. Unfortunately the types of *ormerodi* cannot be traced.

C. sylvicola Winn.

Winnertz's type female of *C. sylvicola* differs from *ormerodi* as described above in the following particulars: antennal flagellum 11-segmented, with necks rather longer than *ormerodi*, penultimate segment with short neck; terminal segment not much narrowed beyond the subapical cup, as long as penultimate. Legs entirely yellowish.

A ♀ agreeing with the type was taken by Mr. A. H. Hamm in the Oxford Museum, 24.x.1917; it may represent a species distinct from *ormerodi*.

C. lobata sp. n.

A small species much resembling *flavipes*, but with quite different hypopygium. Colour apparently variable; in old (possibly immature or faded) specimens the legs of both sexes and abdomen of ♀ are yellowish, in recently collected specimens very much darker.

♂. Penultimate segment of antenna with neck about half as long as basal part (fig. 10, e). Hypopygium (fig. 10, p–r) differing remarkably from other British species in having the coxites produced apically into a rather long thumb-like lobe; ventrally the coxites are united to only a small extent; styles broader than in the other species with apical margin rather truncate and fringed with numerous short hairs; inner surface with a few bristly hairs. Wing-length 1·2–1·5 mm.

♀. Flagellar segments somewhat longer than in *flavipes* but shorter (relatively to their breadth) than in *pumila*; cups very shallow, especially on one side, where they may be reduced to a narrow strip, though the ring is not interrupted; necks very short; ninth seg-

ment with still shorter but distinguishable neck; tenth longer, usually with postmedian cup only but sometimes with a small apical cup, distal part of segment in one or two specimens (rather doubtfully referable to this species; see fig. 10, i) as large as basal part and separated to form an eleventh segment. Last two front tarsal segments short, subequal in length and thickness. Wing-length barely 2 mm.

Herts.: Breachwood Green, 3.v.36, 6 ♂♂ (including type), 2 ♀♀; Todd's Green, 4.v.38, 2 ♀♀. Beds.: Whipsnade, 8.iv.38 (*F. W. E.*). London: Kensington, on windows of British Museum (Natural History), 8.x.91, 4 ♂♂, 6 ♀♀ (*E. E. Austen*). Angus: Breadownie, vii.37, 1 ♂ (*R. L. Coe*).

This species is evidently common and widely distributed, but the male does not appear to have been described before; Winnertz's type ♀ of *C. vittata* is not unlike those described above, but as I am not quite certain that the females described above belong with the males, and as in any case the identity of the type of *vittata* is uncertain, I have not adopted this name.

TWO NEW SPECIES OF ALEURODIDAE FOUND ON FERNS IN GREENHOUSES IN BRITAIN (HEMIPTERA)

By K. N. Trehan, M.Sc., Ph.D., F.R.E.S.

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In 1891, Douglas (*Ent. mon. Mag.* **27**: 44) gave a description of an Aleurodid found on ferns at Kew Gardens and identified it as *Aleurodes filicium* Goldi. Douglas's material is still preserved in the British Museum (Natural History) and through the kindness of Mr. F. Laing, I have been able to examine it. There are quite important structural differences between Douglas's specimens and Goldi's original description (1886, *Mitt. schweiz. ent. Ges.* **7**: 247) which were kindly verified by Mr. Laing. Many of Goldi's type specimens are in the Naturhistorisches Museum, at Bern, but the Director there has informed us that no trace can be found of *A. filicium*; so that it has not been possible to make an actual comparison of the specimens.

In the autumn of 1937, I made a close examination of the species of ferns in the fern house at Kew but failed to discover Douglas's species. On the other hand, two other species were found both of which appear to be undescribed.

The first of them described below as *Aleuroplatus kewensis* resembles more or less that described by Goldi as *A. filicium*, but differs sufficiently to make it certain that it is not the same species.

Baker and Moles (1921, *Rev. Chil. Hist. nat.* **25**) remarked under *A. filicium* " specimens of *extranius* studied by Quaintance and Baker show the two to be alike, only in *extranius* the five spines are on the dorsal surface . . . but the same thing was described by Douglas in 1890 and because of the statements of these two describers they retained the two specific names." Laing considers *extranius* as a printer's error which probably means *extraniens* described by Bemis (1904, *Proc. U.S. nat. Mus.* **27**: 526).

In view of the differences noted in all the immature stages from the original description of *A. extraniens*, the present species is considered distinct.

The second species described below as *Trialeurodes williamsi* is identical with specimens found on ferns in 1914–1915 at the Royal Horticultural Society's Gardens at Wisley, Surrey, by Dr. C. B. Williams, who has been kind enough to permit me to use his material.

The material for the present study was obtained from the Royal Botanic Gardens, Kew. For descriptive purposes the respective stages were obtained from the insects reared under observation and mounted in Berlese's fluid. For the study of the genitalia and finer details the specimens were treated with 10% KOH solution and then neutralised in 2% solution of acetic acid in 90% alcohol and ultimately mounted in balsam.

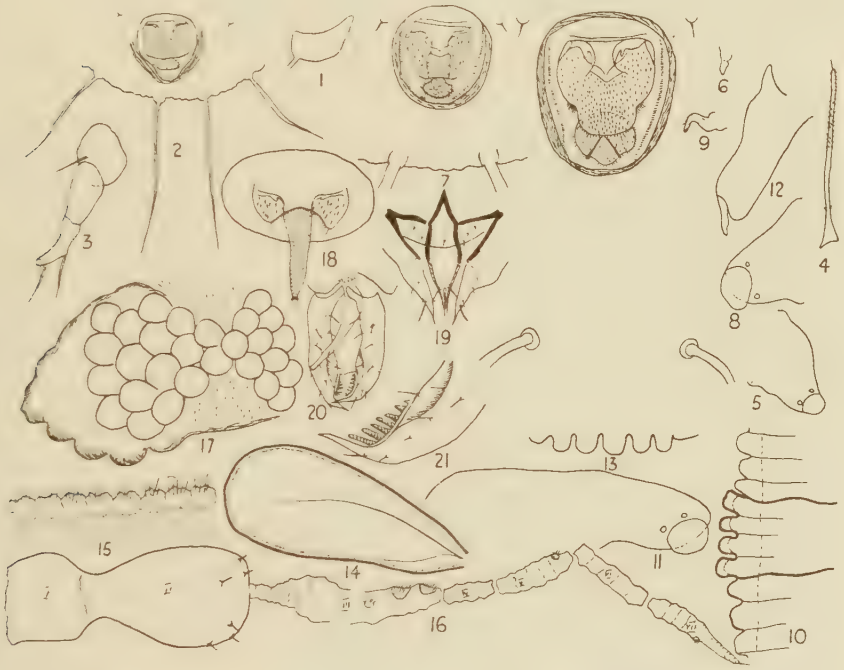
The assistance of Dr. C. B. Williams and Mr. F. Laing is gratefully acknowledged, and the facilities provided by the Director of the Royal Botanic Gardens, Kew, and his staff for the collection of the material and the encouragement by the Indian Central Cotton Committee by the grant of a foreign scholarship are highly appreciated.

Aleuroplatus kewensis sp. n. (figs. 1–21).

Egg (fig. 1). Curved and almost crescentic when lying on the leaf—the concavity directed outwards, narrower at the ends; pedunculate, the stalk inserted well removed from the basal end, often slightly erect in position; yellowish-white when fresh, subsequently turning to brownish and ultimately to shining orange; two pairs of red eye-spots visible before hatching. Length 0·200–0·234 mm.; breadth 0·096–0·110 mm.; average measurements 0·220 × 0·107 mm.; stalk 0·035 mm. long. Laid singly over the underside of the leaves. *Nymph 1st instar.* Elliptical, brownish when hatched, tending to dark brown later, slightly convex in the middle; margins almost entire with a waxy fringe all round and beset with nine (occasionally ten) pairs of bristles—two or sometimes three cephalic, five thoracic and two caudal. Abdominal segments devoid of marginal spines and no bristle between the anal and the caudo-lateral (fig. 2). Length 0·270–0·293 mm.; breadth 0·144–0·165 mm., average measurements 0·286 × 0·153 mm. Four pairs of dorsal spines (occasionally five pairs), one antennal, very much developed, long, brown and directed backwards like whiskers, two thoracic and one cephalad to vasiform orifice, all minute; two pairs of minute ventral spines, one at the region of the rostrum and the other at the level of the vasiform orifice; either one or both of these may be developed. Eyes comparatively large, undivided or constricted; legs (fig. 3) functional, three segmented; antennae long, concolorous with the body, two segmented, the basal segment triangular, wider at the base; the distal segment filamentous, slightly hairy and ending in a spine at the tip (fig. 4); average length 0·070 mm. Vasiform orifice (fig. 2) somewhat pear-shaped, with the caudal extremity narrower, inner lateral and caudal margins thickened, average measurements 0·023 × 0·024 mm.; operculum rectangular, more than half filling the orifice, caudal margin profusely hairy, average measurements 0·014 × 0·016 mm.; lingula relatively small, about 0·011 mm. long, knobbed at the end, setose and slightly exposed beyond the operculum. *Nymph 2nd instar.* Generally oblong, the anterior margin may be narrower, greenish-yellow, margin slightly crenulate, thoracic tracheal folds evident and their endings marked by a comb of a few teeth. Abdominal and thoracic segmentations obvious. Marginal spines three pairs—one cephalic, minute and disposed laterally, one caudo-lateral, minute and a well-developed anal spine; four pairs of dorsal spines—one antennal, two thoracic and one vasiformal, variable in size and presenting all gradations between a well-developed and minute form, occasionally asymmetry also noticeable, ventral spines absent or 2 or 3 pairs in the rostral and vasiform

region. Average measurements 0·410 × 0·238 mm. Legs degenerate as usual, conical stumps ending in circular discs (fig. 5); eyes distinct, entire; antennae extremely reduced, apparently two segmented, directed backward, about 0·010 mm. long (fig. 6). Vasiform orifice almost circular (fig. 7), inner lateral and caudal margins thickened with a nearly continuous row of striations running interiorly, average measurements 0·036 × 0·035 mm.; operculum almost similar in form, about as long as wide and filling roughly ¾ of the orifice, caudal margin with minute hairs, average measurements 0·020 × 0·020 mm.; lingula short, thick and stout, setose, almost inverted, half opened, mushroom-shaped, head profusely spinous, length about 0·014 mm. and only a little of the head exposed beyond the operculum. *Nymph 3rd instar.* Shape, colour and structure with marginal spines corresponding to those in the previous instar. Dorsal spines minute, a pair near the base of antennae and another cephalad to orifice; a single pair of ventral spines in the region of the orifice, measurements about 0·648 × 0·379 mm. Legs (fig. 8) and eyes as in the previous instar, antennae characteristic of the stage, much atrophied, directed inward and hooked at the tip (fig. 9). Vasiform orifice sub-circular, structure similar to that in the previous instar, measurements 0·045 × 0·041 mm.; operculum cup-shaped in outline, broader cephalic and narrower caudal margin, notched postero-laterally, anterior margin shifted from that of the orifice, measurements 0·028 × 0·028 mm., more than half filling the orifice; lingula as in the previous instar, setose and with a pair of brittle bristles at the tip, length 0·024 mm. *Pupa.* Elliptical, occasionally margin notched by the presence of the hairs on the leaf, yellow, convex dorsally, margins dentate with a narrow waxy fringe binding it to the leaf. Dorsum shagreened, submarginal area not distinct from the dorsal disc, and traversed by transverse striations. The mid-dorsal line in the cephalic and thoracic region slightly raised into a low keel. Abdominal segmentation distinct, the median line arched, on each side concolorous squarish designs demarcating the shagreened surface. Tracheal folds ending in a comb of about four teeth (fig. 10). Marginal spines minute, one or two pairs: cephalic, the spines disposed laterally, and a caudo-lateral; dorsal spines variable in number as well as in their development, three or five pairs, one antennal, two thoracic, one cephalad to vasiform orifice and one sub-marginal anal; the thoracic pairs may be absent, the submarginal anals are invariably well developed and setaceous and the other pairs may be minute or very well developed, probably according to the hairy nature of the host plant; ventral spines only a pair in the region of the orifice. Length 0·828–1·03 mm., breadth 0·486–0·648 mm., average measurements 0·952 × 0·567 mm. Legs curved, longer than in the previous instars (fig. 11); antennae developed, directed backward and outward and ending in a minute process, average length 0·066 mm. (fig. 12); eyes conspicuous. Vasiform orifice elevated and bounded by brown edges, general shape and structure corresponding to that in the previous instar and the inner row of striations very prominent (fig. 13), average measurements 0·061 × 0·055 mm.; operculum relatively large, extending almost to ¾ of the orifice with a prominent notch on either of the postero-lateral margins, nearly as long as broad, average measurements 0·034 × 0·036 mm.; lingula about 0·029 mm. stout, inverted, half opened, mushroom-shaped, head profusely ornamented with spines and protruded beyond the operculum. *Adult* (♀). Length 0·900–1·12 mm., body flaccid, yellow throughout, the wax plates slightly whitish. Wings pale, spotless, marginal veins yellow, the outer one shining and dentate (fig. 15); fore-wing about 1·01 mm. long, venation (fig. 14) radial sector and a faint cubitus; wing expanse about 2·34 mm. Antennae concolorous with the body, filiform, seven segmented (fig. 16) (see table for measurements). Segment I nearly square, II subpyriform, very prominent, III longest of all, narrow and imbricate towards the base, a little constricted in the middle and beset with sensoria distally, IV smallest of all, only 2·5 times longer than broad, imbricate, V slightly clavate, imbricate and beset with one sensorium towards the distal extremity, VI cylindrical and imbricate, VII elongate, tapering distally and terminating in a fine spine, a little hairy

towards the distal half and provided with a sensorium. Hinder legs longer than others, average measurements, tibia 0·357 mm. long; tarsus—proximal segment 0·108 mm., distal segment 0·087 mm.; tibia of front leg 0·215 mm.; tarsus—proximal segment 0·087 mm., distal segment 0·078 mm.; paronychium acute. Eyes characteristic, constricted and subpyriform, upper portion small and light in colour, lower darker and bulging out prominently, facets of either division running into the other; in prepared specimens margins thick and deeply coloured (fig. 17). Tip of rostrum dark brown.



Figs. 1–21.—*Aleuroplatus kewensis.*—1. Egg; 2. caudal margin and vasiform orifice—1st instar nymph; 3. leg of 1st instar nymph; 4. antenna of 1st instar nymph; 5. leg of 2nd instar nymph; 6. antenna of 2nd instar nymph; 7. vasiform orifice of 2nd instar nymph; 8. leg of 3rd instar nymph; 9. antenna of 3rd instar nymph; 10. thoracic tracheal fold of pupa; 11. leg of pupa; 12. antenna of pupa; 13. vasiform orifice of pupa; 14. fore-wing of adult; 15. margin of the fore-wing; 16. antenna of female; 17. eye of the adult; 18. vasiform orifice of female; 19. female genitalia; 20. male genitalia; 21. tip of one paramere showing row of teeth.

All figures are × 360 except fig. 1, × 37; fig. 14, × 30; and figs. 19, 20, × 135.

Vasiform orifice transversely oval (fig. 18), average measurements 0·034 × 0·048 mm.; operculum broader than long, usually caudal margin curved inward, measurements 0·022 × 0·034 mm.; lingula long and narrow with a few hairs at the tip, length about 0·029 mm. Genitalia normal (fig. 19).

♂ (3) Concolorous with the ♀. Abdomen tapering posteriorly. 1st abdominal segment almost bead-like and distinct from the rest. Eyes bulging out and very prominent as in the ♀. Vasiform orifice similar to that of ♀ but the lingula relatively shorter. The genitalia conspicuously different and marked by the shape of the parameres, which end in a claw-shaped structure and are beset with a row of seven teeth towards their distal

inner surface (figs. 20 and 21). The teeth are almost blunt and gradually increase in size distally.

Described from many specimens of various stages. The type specimen which emerged on 27th January, 1938, from a pupa on *Nephrolepis confluens* F. Mueller, and also a pupa from *Anemia* sp. collected from Royal Botanic Gardens, Kew, Surrey, 17th September, 1937, will be deposited in the British Museum (Natural History). Found on *Dryopteris flaccida*: *Diplazium proliferum*; *Nephrolepis confluens*; *Anemia* sp. and *Oleandra africana*, etc., etc. Dates of capture from 20th August, 1937, to February 1938.

Remarks.

(1) *a*. The following differences have been observed in Douglas's specimen of *A. filicium*: Margin sinuate with a parallel inner line which is more or less dentate; a series of small marginal spines, the anal pair long and very conspicuous. Vasiform orifice without an inner row of striations, lingula not prominently knobbed and entirely obscured by the operculum.

b. The following points of difference have been noticed in the description of *A. extraniens* by Bemis: Larva of 1st instar without a fringe of wax, marginal spines only two pairs—latero-cephalic and latero-caudal; antennae not visible. In the pupa, vertical, ventral secretion of wax, the lateral wax tubes distinct and bent downward; lingula with the distal portion rounded and the apex divided into two minute pointed lobes.

(2) This species is provisionally assigned to the genus *Aleuroplatus*. The characters of the pupa case in this species fall between the genera *Aleuroplatus* and *Asterochiton*, according to the key to genera and species by Quaintance and Baker (1917) and Baker and Moles (1921). As the vasiform orifice in the later genus is typically subcordate, the species under discussion differs from it. On the other hand, though the characters of this organ do not agree with those described in the type species of *Aleuroplatus*, they are practically identical with those in some species described by Quaintance and Baker (1917) so far as their shape is concerned.

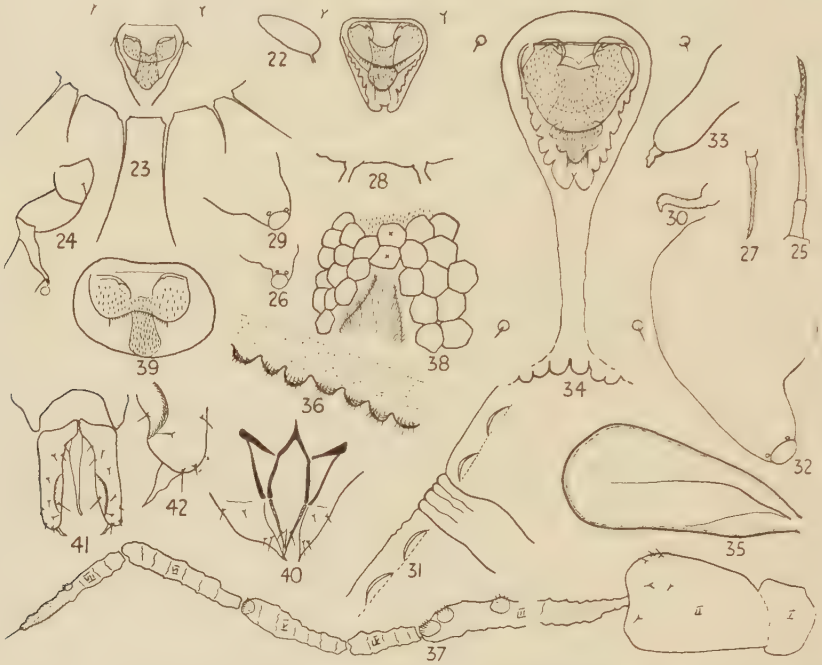
(3) Only a single male has been reared out from a large number of pupae under observation. Collections from Kew Gardens and emergences in the laboratory produced the females. Because of the predominance of the females in this species it is probable that reproduction may be primarily parthenogenetic. Occasionally females have been noticed with a considerable number of developed eggs in their abdomen even before emergence from the pupa, which indicates a probability of their laying soon after emergence.

Trialeurodes williamsi sp. n. (figs. 22–42).

Egg (fig. 22). Oblong, elongate and rounded at the extremities; pedunculate, the stalk inserted a little on one side of the basal end, lying almost horizontally on the leaf surface; colour greenish-yellow when fresh, subsequently changing to brown; two pairs of red eye-spots prominent before hatching. Length 0·172–0·207 mm.; breadth 0·072–0·082 mm.; average measurements 0·188 × 0·078 mm.; stalk 0·026 mm. Laid singly and scattered on the underside of the leaves. *Nymph 1st instar*. Oblong, greenish-yellow, flat; margin entire with a waxy fringe all round; marginal spines 17–18 pairs—three cephalic, the median and sublateral relatively better developed, eleven or twelve laterals

almost subequal, three caudals, the anal and the outer caudo-lateral better developed (fig. 23). Length 0·255–0·276 mm.; breadth 0·132–0·150 mm.; average measurements 0·264 × 0·138 mm. One or two pairs of extremely minute dorsal spines, one antennal and one cephalad to vasiform orifice; two or three pairs of ventral spines, one rostral and one or two in the region of the vasiform orifice which are generally better developed. Eyes relatively large, may be entire, constricted or even divided; legs (fig. 24) functional, three segmented; antennae long, brownish and three segmented, the basal segment short and flat, the 2nd cylindrical and the 3rd longest of all, slightly hairy distally and beset with two minute spines—one at the extremity and the other at a distance of about $\frac{3}{4}$ of its length, average length 0·070 mm. (fig. 25). Vasiform orifice almost triangular (fig. 23), approaching near the margin and open at the caudal end; inner lateral margins not thickened, floor with a ridge-like thickening, average measurements 0·025 × 0·025 mm.; operculum semicircular, average measurements 0·012 × 0·017 mm.; lingula long and spatulate, on an average 0·014 mm. long, setose, about $\frac{2}{3}$ exposed beyond the operculum. *Nymph 2nd instar.* Oblong, pale greenish-yellow, margins almost entire, abdominal segmentations marked by a series of circular areas on either side of the median line. Marginal spines three pairs—cephalic, caudo-lateral and anal in position; three pairs of minute dorsal spines—antennal, abdominal and vasiformal; ventrals absent or a pair in the region of the orifice; average measurements 0·366 × 0·196 mm. Legs degenerate (fig. 26) conical stumps with a disc at the tip; eyes entire; antennae atrophied, conspicuously long, apparently three segmented, the last one being the longest and a little hairy, directed backward and on an average, 0·032 mm. long (fig. 27). Vasiform orifice subcordate, deeply notched in the caudal margin (fig. 28), average measurements 0·032 × 0·031 mm.; operculum transversely elliptical, almost semicircular in shape, about half as much broader than long and half filling the orifice, average measurements 0·016 × 0·023 mm.; lingula long, thick and spatulate, average length 0·017 mm. and half exposed beyond the operculum. *Nymph 3rd instar.* Corresponds to the previous instar in shape and colour, thoracic tracheal folds indicated by three small teeth at the margin, abdominal and thoracic segmentations obvious, the former marked by circular areas. Distribution of the various spines corresponds to that in the previous instar, average measurements 0·508 × 0·300 mm. Legs (fig. 29) and eyes as in the previous instar, slightly enlarged; antennae characteristic of the stage (fig. 30), much atrophied and directed inward, hooked at the tip and slightly hairy, average length 0·022 mm. Shape of the vasiform orifice corresponds to that in the previous stage, inner lateral margins ridged, average measurements 0·043 × 0·036 mm.; operculum similar to that in the previous stage, average measurements 0·023 × 0·030 mm.; lingula spatulate, lobed distally and armed with a pair of bristles at the tip, about 0·024 mm. long and half exposed. *Pupa.* Elliptical, elongate and narrower at the extremities, greenish-yellow, slightly raised and enclosed within a surrounding wall of wax; dorsum lightly dimpled, convex medially, flatter laterally. Submarginal area narrow, not separated from dorsal disc which is traversed by striations. A series of 26–32 pairs of crescent-shaped submarginal papillae from which arise long tape-like structures of wax, a pair at each extremity is relatively longer and more prominent than the others which are almost subequal; these tapes are slightly arched and often rest on the leaf surface. Abdominal and thoracic segmentation obvious; tracheal folds evident, ending at the margin in a comb of 3–4 teeth (fig. 31). Average measurements 0·783 × 0·457 mm. Legs curved and longer than in the previous instars (fig. 32); antennae better developed, directed backward and outward and ending in a minute process (fig. 33), average length 0·044 mm. Eyes conspicuous, often constricted. Vasiform orifice subcordate, extending posteriorly in a deep furrow to the caudal margin, inner lateral margins toothed and the thickened sides meeting caudad, average measurements 0·065 × 0·055 mm. (fig. 34); operculum about half as broad again as long, caudal margin hairy, about half filling the orifice, average measurements 0·030 × 0·042 mm.;

lingula long and spatulate, distally seven lobes prominent, three on either side and one median, setose, armed with a pair of prominent bristles at the tip, length 0·035 mm. and $\frac{3}{4}$ of the lobed area exposed.



Figs. 22–42.—*Trialeurodes williamsi*.—22. Egg; 23. caudal margin and vasiform orifice—1st instar nymph; 24. leg of 1st instar nymph; 25. antenna of 1st instar nymph; 26. leg of 2nd instar nymph; 27. antenna of 2nd instar nymph; 28. vasiform orifice of 2nd instar nymph; 29. leg of 3rd instar nymph; 30. antenna of 3rd instar nymph; 31. thoracic tracheal fold of pupa; 32. leg of pupa; 33. antenna of pupa; 34. vasiform orifice of pupa; 35. fore-wing of adult; 36. margin of the fore-wing; 37. antenna of female; 38. eye of the adult; 39. vasiform orifice of female; 40. female genitalia; 41. male genitalia; 42. tip of one paramere.

All figures are × 360 except fig. 1, × 37; fig. 35, × 30; and figs. 40, 41, × 135.

Adult (♀). Length 0·945–1·07 mm.; body flaccid, whitish, tending towards pale at the sides and distal part of legs. Wings white, spotless, marginal veins yellow, shining and dentate (fig. 36); fore-wing about 1·01 mm. long, venation—radial sector and a faint cubitus (fig. 35); wing expanse about 2·22 mm. Antennae concolorous with the body, filiform and seven segmented (fig. 37) (see table for measurements), segment I subglobose, II subpyriform, very prominent, III longest of all, narrow and imbricate towards the base, relatively narrower in the middle and beset with sensoria distally, IV smallest of all, cylindrical and imbricate, V slightly clavate, imbricate and beset with a sensorium towards the distal end, VI cylindrical and imbricate, VII elongate, tapering distally and ending in a fine spine, slightly hairy towards the distal half and provided with a sensorium, segments V–VII subequal. Hinder legs longer than others, average measurements, tibia 0·334 mm. long; tarsus—proximal segment 0·092 mm., distal segment 0·094 mm.; tibia of front leg 0·222 mm.; tarsus—proximal segment 0·063 mm., distal segment 0·076 mm.;

paronychium acute. Eyes constricted, the two halves connected by a bridge of two facets in a longitudinal row (fig. 38), crimson red. Vasiform orifice transversely oval (fig. 39), average measurements 0·034 × 0·048 mm.; operculum much broader than long, subrectangular, about 0·014 × 0·034 mm.; lingula small, swollen at the tip, about 0·018 mm. long. Genitalia normal (fig. 40).

♂. Concolorous with the ♀, a little smaller in size. Vasiform orifice also similar to that of ♀. Genitalia (figs. 41, 42) with characteristic parameres, long and narrow, almost uniformly broad, rounded at the distal end and provided with a characteristic beak-like process, each half beset with about ten spines; aedeagus long and narrow, shape normal.

Described from many specimens of various stages. The type specimen which emerged on the 20th October, 1937, from a pupa on *Anemia* sp. and also a pupa on *Oleandra africana* collected from Kew Gardens on the 17th September, 1937, will be deposited in the British Museum (Natural History). Found on *Dryopteris flaccida*; *Diplazium proliferum*; *Nephrodium confluens*; *Anemia* sp. and *Oleandra africana* etc., etc. Dates of capture from 20th August, 1937, to February 1938.

Remarks.

The genus to which this species is assigned is quite provisional. The characters of the pupa-case fall between *Aleuroparadoxus* and *Trialeurodes*. It is included in *Trialeurodes* because of the characteristic agreement in the general shape and the structure of the vasiform orifice of the pupa with that genus.

Table I.

Species	Sex	Average measurements of each segment in mm.							Total length (mm.)
		I	II	III	IV	V	VI	VII	
Trialeurodes williamsi .	♀	0·021	0·052	0·110	0·030	0·041	0·043	0·048	0·345
,,	♂	0·020	0·051	0·108	0·028	0·038	0·040	0·040	0·325
Aleuroplatus kewensis .	♀	0·024	0·061	0·137	0·017	0·027	0·033	0·036	0·335

ON *CILLENUS* SAMOUELLE (COLEOPTERA, CARABIDAE)

By H. E. Andrewes, F.R.E.S.

Cillenus, treated during last century as a genus, has in recent years been reduced to the rank of a subgenus of *Bembidion*. Including Dupuis' *Armatocillenus formosanus*, nine species are enumerated in Csiki's Catalogue, but one of these is a synonym. Descriptions of two other species have since appeared, and one new one is described here, making eleven in all. Some of these insects present unusual characters, and the authors who described them have evidently placed them in the group with hesitation. Nevertheless, it is not my intention to introduce a number of new subgeneric names, and all that is attempted here is to tabulate the species, and, as the original descriptions are scattered through numerous periodicals, some of them difficult of access, and as, moreover, many of them are inadequate, to add a fuller description of each. Although the material available is in some instances scanty, I have found it possible to examine most of the types; of one species, however, I have seen no example, viz. the recently described *C. tillyardi* Brookes from New Zealand, and here I can only reproduce the original description. I have to thank various correspondents for their help, viz. Mr. Arrow of the British Museum, Dr. W. Horn of the Deutsches Entomologisches Museum, Prof. O. de Beaux of the Genoa Civic Museum, and the Curator of the Macleay Museum in Sydney; special thanks are due to my friend Mr. H. J. Carter of Sydney, who obtained for me two specimens of one of the two Australian species, and presented me with an example of the other one from his own collection.

Features common to all the species of the group are the very wide head, not contracted behind, and almost as wide as the prothorax, the long, curved, powerful mandibles, and the wide marginal channels of the elytra. The body is usually impunctate and glabrous. The eyes are moderately prominent, the antennae rather short and sometimes moniliform, fully pubescent from segment 4, though the apical half of segment 3 and the apex of 2 are more or less setulose. The prothorax is nearly always strongly contracted behind, so that the base is narrower than the apex, its sides are bisetose, the front seta placed far forward, the basal sulcus is generally very deep, placed at some distance from the margin, between which and the sulcus a rudimentary border is sometimes present, and the hind angles are without carina. The elytra are variable in form and striation, the scutellary striole slight, the apical stria usually merging in the general striation; the border is sometimes rounded at shoulder, sometimes angulate, and does not extend inwards beyond stria 4; the apex is subtruncate, and more or less emarginate on each side; the number of dorsal pores varies from 2 to 4. All the species have an isodiametric microsculpture, generally a very distinct one. In the protarsi (♂) the two basal joints are usually dilated and outwardly produced, with a spine at the apex of the first segment.

So far as is known, all the species frequent the seashore, and are generally found far below high-water mark.

Key to the species.

1(14). Hind lateral seta of the prothorax placed on or near the hind angle; metepisterna long, narrow, and strongly contracted behind. Elytra flat, or only moderately convex, generally parallel-sided, with square shoulders, widest at or behind middle, fully striate.

2 (5). Elytral border rounding shoulder and continuing inwards to a point opposite stria 5.

3 (4). Antennae moniliform, base of prothorax with a few punctures, elytra flat and parallel-sided, with four dorsal pores. Length 3–4 mm. (western coasts of Europe, Morocco).

Underside, head, and prothorax dark metallic green or cupreous; palpi, three basal segments of antennae, legs, hind angles and sometimes lateral margins of prothorax, and the elytra pale ferruginous, the elytra dull and usually with a vague greenish cloud on the disk just behind middle. *Head* with wide, rather shallow frontal furrows, extending to clypeus. *Prothorax* convex, cordate, a fourth wider than long, base unbordered at middle, sides well rounded in front and strongly sinuate before base, hind angles sharply rectangular; median line fine, front transverse impression slight, vaguely punctate, basal sulcus and the small foveae fairly deep. *Elytra* about a fourth wider than prothorax, nearly two-thirds longer than wide, a slight emargination on each side behind, where stria 8 joins the marginal channel; striae moderately deep and finely punctate, 1 and 2 deep to apex, where they join, 8 deep behind; intervals moderately convex, the inner wider than the outer ones. Metasternal process with only the vestige of a border, a transverse depression behind it.

Type not now traceable . . . . . *laterale* (Sam.).*

(The variety *bedeli* Nicolas (1906, *L'Échange* **22** : 13) is only a form which has lost all the green colour and is consequently very pale.)

4 (3). Antennae filiform, base of prothorax impunctate, elytra moderately convex, with the sides a little rounded, two dorsal pores. Length 5·5–6·5 mm. (China : Foochow (*M. S. Yang*), numerous examples).

Pale ferruginous, moderately shiny, elytra a little dull; palpi, segments 1 to 4 of antennae, and legs flavous; rest of antennae, apex of mandibles, vertex, front and hind margins of prothorax, base and an area near apex of elytra more or less fuscous. *Head* with wide, fairly deep frontal furrows, extending to clypeus, their surface behind vaguely rugose striate. *Prothorax* convex, cordate, a fourth wider than long, apex a third wider than base, which is truncate and bordered at middle, sides rounded in front, sinuate at a fourth from base, hind angles right and moderately sharp; median line fairly deep, front margin vaguely punctate and longitudinally striate, basal sulcus very deep. *Elytra* rather more than a third wider than prothorax and longer than wide in the same proportion, moderately emarginate on each side near apex; striae appearing dark on the pale background, fairly deep, and evidently, though finely, crenulate, 5 joining 1 at apex, and 6–7 disappearing at some distance from apex; intervals a little convex on disk, more convex at sides, the two dorsal pores adjoining stria 3, placed at a half and five-sixths, another pore close to apex. Prosternum sulcate, metasternal process unbordered, with an elongate convexity.

Type in the British Museum . . . . . **sinicum** sp. n.

5 (2). Elytral border angulate at shoulder.

6 (9). Metatrochanters, at least in the ♂, three-fifths as long as femora, each produced at extremity into a long slender point (*Armatocillenus*).

7 (8). Base of prothorax wider than apex, elytra moderately convex, shoulders rounded, striae shallow, four dorsal pores, colour pale ferruginous. Length 4·5 mm. (Formosa : Anping).

Basal segments of antennae and legs flavous; surface moderately shiny. *Head* with very shallow frontal furrows, not extending to clypeus,

* 1819, *Ent. Compend.* : 148.

antennae filiform but a little dilated at apex. *Prothorax* moderately convex, very little contracted behind, a fifth wider than long, base arcuate, nearly a fourth wider than apex, very gently rounded in front and then straight to base, hind angles fairly sharp but slightly obtuse; median line slight, basal sulcus very deep, terminating at each end in the punctiform basal foveae. *Elytra* elongate-oval, moderately convex, parallel-sided, a third wider than prothorax, five-sixths longer than wide, border extending inwards to a point opposite stria 4, a deep emargination on each side behind, the outer angle of which is dentate; striae very lightly impressed, a little deeper near apex, vaguely crenulate; intervals nearly flat, the hindmost dorsal pore close to apex. Prosternal process sulcate; metasternal process also sulcate, vaguely bordered at sides; metatrochanters in the ♀ (*teste auctor*) shorter than in the ♂, pointed but not prolonged.

Type (♂) in the Deutsches Entomologisches Museum, Berlin-Dahlem. This is the only example seen . . . . . *formosanum* (Dupuis).*

8 (7). Base of prothorax narrower than apex, elytra rather flat, striae moderately deep, two dorsal pores, colour black, each elytron with a small post-humeral ferruginous spot. Length 4 mm. (New Guinea: Sorong).

Piceous beneath; palpi (except penultimate segment of the maxillaries fuscous), antennal segments 1, 2, and basal half of 3 (rest fuscous), tibiae, and tarsi ferruginous. *Head* with fairly deep, wide, parallel, uneven furrows, extending to clypeus, and separated on each side from the eye by a rounded ridge, antennae slender, filiform, slightly dilated towards apex. *Prothorax* convex, cordate, a third wider than long, base arcuate, with a slight emargination on each side close to the angle, vaguely bordered at middle, sides with a slightly crenulate border, moderately rounded in front, sinuate near base, hind angles right and sharp; median line fine, basal sulcus very deep, crenulate, merging in the foveae at sides. *Elytra* rather flat, only slightly dilated behind, a sixth wider than prothorax, nearly twice as long as wide, border extending inwards to stria 4, a slight emargination on each side behind; striae moderately deep, vaguely crenulate, a little deeper at sides and much deeper at apex, especially 2, 5, and 8; intervals slightly convex on disk, more convex at sides and apex, the inner wider than the outer ones, 6 raised near apex. Prosternal process sulcate, metasternal process uneven but not bordered.

Type in the Genoa Civic Museum. This, the only example seen, is apparently a ♂, but the condition of the specimen renders this a little uncertain . . . . . *albertisi* (Putz.).†

9 (6). Metatrochanters normal, less than half as long as femora, and more or less rounded at apex.

10(11). Elytra very flat, the basal border extending from shoulder to stria 4 (though rather vague between 4 and 5), colour of upper surface aeneous, elytra with an olivaceous tinge. Length 4·5–5 mm. (Japan: Yokohama, Kawasaki and Hiratsuka; Osaka, Hamadera).

Palpi (except the apical, and sometimes also the penultimate segment), the three basal segments of the antennae, legs (apex of tibiae and the tarsi fuscous), and lateral and apical borders of elytra pale ferruginous, the elytra sometimes (type) with a brownish patch nearly covering the basal third. *Head* with wide and fairly deep frontal furrows,

* 1912, *Ann. Soc. ent. Belg.* **56**: 334.
† 1875, *Ann. Mus. civ. Stor. nat. Genova*, **7**: 748.

extending to clypeus, antennae filiform. *Prothorax* rather flat, subcordate, a third wider than long, base arcuate, a little narrower than apex, with a shallow border at middle, sides gently rounded in front, faintly sinuate before base, hind angles sharp, though a little obtuse; median line slight, basal sulcus and foveae deep, the sulcus uneven. *Elytra* slightly dilated behind, about a fourth wider than prothorax, four-fifths longer than wide, a slight emargination on each side behind; striae moderately impressed, impunctate; intervals nearly flat, the inner wider than the outer ones, 6 strongly raised at apex, two dorsal pores adjoining stria 3, another close to apex. Metasternal process unbordered, with an elongate convexity, depressed at sides and behind.

TYPE in the British Museum . . . . . *yokohamae* (Bates).*

11(10). Elytra somewhat convex, the basal border extending from shoulder to stria 5, colour of upper surface mainly ferruginous.

12(13). Form long and narrow, upper surface shiny; prothorax a fifth wider than long, only moderately contracted behind and with only a vestige of a basal border; elytra parallel-sided, three-quarters longer than wide. Length 4·5–5 mm. (but my two examples are under 4 mm. long) (NEW SOUTH WALES: Sydney, Port Jackson and La Pérouse).

Ferruginous, head and prothorax dark green, shiny; elytra each with the base, sutural interval (on basal half), a discal spot of variable size, situated between the dorsal pores, and a small transverse spot near apex piceous, with faint greenish reflections; segments 5 to 11 of the antennae brown (one of my two examples is ferruginous throughout). *Head* with deep, parallel, frontal furrows, extending to clypeus, antennae submoniliform. *Prothorax* convex, cordate, base arcuate, evidently narrower than apex, sides rather gently rounded in front, sinuate a little before base, hind angles right and sharp; median line moderately impressed, basal sulcus and foveae deep. *Elytra* elongate-oval, moderately convex, a fourth wider than prothorax, subtruncate behind; striae moderately impressed, almost imperceptibly crenulate, none quite reaching base; intervals only slightly convex, the inner not much wider than the outer ones, two dorsal pores and a third close to apex. Metasternal process hardly raised, slightly depressed at sides.

TYPE in the Museum of the Council of Scientific and Industrial Research, Canberra . . . . . *mastersi* Sloane.†

13(12). Form moderately wide, upper surface shagreened; prothorax a third wider than long, strongly contracted behind, median part of base evidently bordered; elytra with gently rounded sides, a half longer than wide. Length 4·2–4·7 mm. (but my example is 5 mm. long) (QUEENSLAND: Townsville).

Ferruginous, basal half of venter piceous; head (excluding neck), middle of base of prothorax, and a vague cloud overspreading the elytra (except lateral margins), most visible near base and on apical half, green; inner margin and apex of mandibles piceous; 3 basal segments of antennae (rest fuscous), palpi, and legs flavous. *Head* with deep, wide, frontal furrows, extending to clypeus, antennae filiform, dilated towards apex. *Prothorax* convex, cordate, base slightly arcuate, sides strongly rounded in front and as strongly sinuate behind, hind angles right and sharp; median line slight,

* 1883, *Trans. ent. Soc. Lond.* **1883**: 268.
† 1894, *Proc. linn. Soc. N.S. Wales* (2) **9**: 404.

basal sulcus and foveae deep, finely crenulate. *Elytra* somewhat convex, elongate-oval, a fourth wider than prothorax, subtruncate behind; striae moderately impressed, impunctate, none quite reaching base; intervals nearly flat, the inner not much wider than the outer ones, 6 raised behind, two dorsal pores and a third close to apex. Prosternal process sulcate; metasternal process unbordered and with an elongate convexity.

Type in the Museum of the Council of Scientific and Industrial Research, Canberra. Only one example seen . . . . . *albovirens* (Sloane).*

14 (1). Hind lateral seta of prothorax placed conspicuously on the border at about a sixth in front of the angle; metepisterna a little longer than wide. Elytra very convex, with rounded sides, widest at about basal fourth, striae shallow or obsolete at sides and near apex, surface shiny (all New Zealand).

15(20). Elytra with three, sometimes four, dorsal pores.

16(19). Prothorax strongly contracted behind, so that the apex is about a third wider than the base; elytral striae moderately impressed on disk, border subangulate at shoulder and bending back for a very short distance to a point opposite stria 5. Colour yellowish-white with black or dark aeneous markings. Length 4–5 mm.

17(18). Elytral border moderately dilated and reflexed at the point where the marginal channel terminates behind, with a slight inner emargination on each side, surface surrounding the shoulders strongly shagreened. Length 4–5 mm. (Tairwa, near Auckland).

Head, base, apex, and disk of prothorax, suture of elytra and a triangular spot on each, based on stria 2, and extending to stria 7, the two spots joining at a third from apex, black or dark aeneous; sides of prothorax and basal ventral segments brown; antennae darker towards apex. *Head* with moderately deep, uneven, parallel, frontal furrows, extending to clypeus, front supraorbital pore adjoining eye very large, antennae submoniliform. *Prothorax* very convex, a fifth wider than long, widest a little before middle, base arcuate, apex slightly emarginate, nearly a third wider than base, sides very narrowly bordered, strongly rounded from apex up to a point close to base, where there is a slight sinuation, hind angles inconspicuous, a little obtuse; median line slight, basal sulcus deep, somewhat crenulate, placed much nearer to base than in the non-endemic species, not quite reaching the small foveae, which adjoin the hind angles. *Elytra* convex, obovate, a third wider than prothorax, three-fifths longer than wide, shoulders completely rounded; striae vaguely crenulate, moderately deep on disk, shallower at sides and behind, obsolete on shoulders, 1 deep to apex, striole vestigial, marginal channel widening out a good deal on apical half; intervals convex on disk only, the inner, especially 2, wider than the outer ones, the three dorsal pores on the interval, though near stria 3, at about a fifth, three-fifths, and four-fifths, another close to apex. Microsculpture of the elytra formed by very small meshes; on the head the meshes are very faint, and there is none on the disk of the prothorax. Metasternal process unbordered. Protarsi ♂ with segments 1 and 2 strongly dilated and outwardly produced at apex.

Type in the British Museum . . . . . *albescens* (Bates).†

18(17). Elytral border strongly dilated and reflexed behind, with a fairly deep inner emargination on each side, the outer angle of which projects

* 1903, *Proc. linn. Soc. N.S. Wales*, **28** : 575.
† 1878, *Ent. mon. Mag.* **14** : 193.

backwards as a rounded tooth, surface surrounding the shoulders shiny. Length 5 mm. (Karekare, west of Auckland).

Underside more or less ferruginous; head, prothorax, and disk of the elytra black; palpi, segments 1 to 4 of antennae (rest brownish), legs, epipleura, and sides of elytra flavous, the pale colour on the elytra only covering the marginal channel at middle, but widening out at both extremities, and close to base and apex reaching stria 2.

Very nearly allied to *albescens*, but a little narrower. *Head* and *prothorax* as in that species, but the antennae are more evidently moniliform. *Elytra* narrower, four-fifths longer than wide, the sides less rounded, the marginal channel and apical truncature differing considerably, as set forth above.

TYPE in the British Museum . . . . . *alacre* (Broun).*

19(16). Prothorax moderately contracted behind, the apex barely a fifth wider than base; elytral striae shallow, even on disk, the border terminating at shoulder, without bending backwards and inwards. Colour ferruginous, with some slight brownish markings. Length 3·5–4 mm. (Port Chalmers).

The brown markings include the head, disk of prothorax, suture of elytra, and venter. Smaller than *albescens* and quite different in colour. *Head* with the antennae shorter and evidently moniliform. *Prothorax* less contracted behind, the basal sulcus shallower. *Elytra* hardly more than a half longer than wide, the marginal channel not quite so wide behind, the emargination on each side slighter; striae shallow, faint at sides, finely but distinctly punctate, more evidently than in *albescens*, owing to the flatter intervals.

TYPE in the British Museum, as is the type of *batesi* Sharp (see below) . . . . . *chalmeri* (Broun).†

20(15). Elytra with two dorsal pores (Tahuna, Nelson) " Nitid, elongate, convex, body testaceous, thorax darker; head, tips of mandibles, and a narrow portion of front of thorax and basal margin piceous. Head, hardly as broad as thorax, smooth, with interocular depressions; eyes large and prominent. *Thorax* as broad as long, sides rounded, marginate, widest just before the middle, narrowest behind, a little incurved apically, base subtruncate, with a transverse depression, disc with a distinct median line, and a faintly raised semicircular ridge just behind the apex; lateral margins with 2 setigerous punctures on each side, one a little in front of the middle, the other near the posterior angles. *Elytra* two and one-third times as long as prothorax, elongate-ovate, widest at middle thighs, broadly rounded and slightly narrowed to apices, interstices flatly convex, striae shallow, with feeble punctures, the third interstice with two fuscous setigerous punctures on each side. *Legs*, anterior tibiae moderately stout, median and posterior slender, all bearing pallid hairs, and also the tarsi, tibial spurs long and slender.

Holotype, male, length 4 mm., breadth 1·4 mm.

Allotype, female, length 3·9 mm., breadth 1·3 mm.

In collection Cawthron Institute, Nelson.

Paratypes in author's collection." . . . . . *tillyardi* (Brookes).‡

Note.—Since the above memoir was written a specimen has come to light in the British Museum collection which proves to belong to a new species.

* 1921, *Bull. N.Z. Inst.* **1** (7) : 601.

† 1886, *Man. N.Z. Col.* **3** : 881 (= *batesi* Sharp, 1886, *Sci. Trans. R. Dublin Soc.* **3** (2) : 374 = *batesianum* Csiki, 1928, *Carabidae Col. Cat.* **97** : 130).

‡ 1927, *Trans. N.Z. Inst.* **57** : 563.

Bembidion (Cillenus) insularum sp. n.

Length 4·5 mm.

Aeneous, brighter above than beneath; palpi, segments 1 to 3 of antennae, legs, marginal channel and epipleura of elytra more or less ferruginous; metasternum brownish.

Head with deep, wide, frontal furrows, extending to clypeus, surface impunctate, antennae filiform. *Prothorax* convex, cordate, fully a third wider than long, apex a third wider than base, which is arcuate and, except for a short distance, bordered at middle, widest close to apex, sides with a rather thick border, crenulate on basal half, gently rounded, strongly contracted behind, slightly sinuate before the angles, which, though sharp, are a little obtuse; median line deep on the disk only, front transverse impression vague, some slight transverse rugae behind it at middle, basal sulcus very deep, finely crenulate, surface impunctate. *Elytra* only moderately convex, parallel-sided, about a third wider than prothorax, two-thirds longer than wide, border rounding shoulder and curving slightly back, to end in a small tubercle, at which point the marginal channel joins stria 5, a moderate sinuation on each side behind; striae deep, finely crenulate, 1, 2, and the striole arising together in a large umbilicate pore, 6 and 7 terminating at some distance from apex; intervals convex, more convex at sides, the inner a good deal wider than the outer ones, two dorsal pores adjoining stria 3, at a half and four-fifths, another pore close to apex, surface impunctate. Metasternal process unbordered, metepisterna longer than wide, metatrochanters not produced to a fine point at apex.

Fiji: Suva (*C. T. McNamara*), 2.v.1925, 1 ex.

In the foregoing key the species comes near *laterale* and *sinicum*, but in appearance it is more like *yokohamae*. Smaller and more convex than the last-named species, upper surface bright instead of dull, elytral striae deeper, especially stria 1, intervals much more convex, border not angulate at shoulder, and not extending inwards beyond stria 5.